

AMENDMENTS TO THE CLAIMS

1. (currently amended) A ~~catalyst~~ metal based material, comprising:

one or more metals having a crystalline grain size of about 1 to about 200 nanometers,
wherein the metal based material has a crystallographic strain of about 0.1 to about 5.0 percent
and is of a high phase purity; and

wherein the metal based material is formed by cavitation wherein the cavitation
comprises passing a metal containing solution at elevated pressure and at a velocity into a
cavitation chamber, wherein said cavitation chamber creates a controllable cavitation zone to
form a cavitated product.

2. (canceled)

3. (currently amended) The ~~catalyst~~ metal based material of claim 1, wherein the cavitation
includes chamber comprises a flow through channel having a flow area, internally containing a
first element that produces a local constriction of the flow area, and having an outlet downstream
of the local constriction; and a second element that produces a second local constriction
positioned at the outlet, wherein a cavitation zone is formed immediately after the first element,
and an elevated pressure zone is created between the cavitation zone and the second local
constriction passing a metal containing solution at elevated pressure and at a velocity into a
cavitation chamber, wherein the cavitation chamber creates a controllable cavitation zone to
form a cavitated product.

4. (canceled)

5. (currently amended) The ~~catalyst~~ metal based material of claim 43, wherein the metal
containing solution is includes a metal salt solution.

6. (currently amended) The catalyst metal based material of claim 5 wherein the metal salt is selected from the group consisting includes one or more of nitrate, acetate, chloride, sulfate, bromide, and mixtures thereof.
7. (currently amended) The catalyst metal based material of claim 6, wherein the metal in the metal containing solution is selected from the group consisting includes one or more of, cobalt, molybdenum, bismuth, lanthanum, iron, strontium, titanium, silver, gold, lead, platinum, palladium, yttrium, zirconium, calcium, barium, potassium, chromium, magnesium, copper, zinc, and mixtures thereof.
- 8-10. (canceled)
11. (new) The metal based material of claim 1, wherein the high phase purity includes a purity higher than that of a same metal based material prepared by a classical co-precipitation synthesis.
12. (new) The metal based material of claim 1, including one or more metals having a crystalline grain size of about 1 to about 20 nanometers.
13. (new) The metal based material of claim 1, wherein the metal based material includes one or more of, nanostructured materials, solid state materials, metal supported materials, and catalysts.
14. (new) The metal based material of claim 1, wherein the metal based material comprises one or more of, catalysts, capacitors, piezoelectric materials, titanias, superconductors, electrolytes, ceramic based products, oxides, zeolites, and fine grains of slurries of finely divided reduced metals.
15. (new) The metal based material of claim 1, wherein the one or more metals are deposited on a solid support.

16. (new) The metal based material of claim 1, wherein one or more of, the crystalline grain size, and the crystallographic strain, is capable of being varied based, at least in part, on modification of process conditions of the cavitation.

17. (new) The metal based material of claim 16, wherein the process conditions of the cavitation includes one or more of, varying cavitation bubble size, and varying a length of a cavitational zone.

18. (new) A material formed by cavitation, comprising:

a metal having a crystalline grain size of about 1 to about 20 nanometers and a phase purity higher than that of the material formed by a classical co-precipitation synthesis; and

wherein the metal includes one or more of, cobalt, molybdenum, bismuth, lanthanum, iron, strontium, titanium, silver, gold, lead, platinum, palladium, yttrium, zirconium, calcium, barium, potassium, chromium, magnesium, copper, zinc, and mixtures thereof.

19. (new) The material of claim 18, wherein the material has a crystallographic strain of about 0.1 to about 5.0 percent.

20. (new) The material of claim 18, wherein the material is one or more of a, nanostructured catalyst, solid state material, and metal supported catalyst.

21. (new) A metal based material, comprising:

one or more metals having a crystalline grain size of about 0.1 to about 100 nanometers, wherein the metal based material has no secondary phase in its composition and has a crystallographic strain of about 0.1 to about 5.0 percent;

wherein the metal based material includes one or more of, nanostructured materials, solid state materials, metal supported materials, and catalysts; and

wherein at least one of the metals includes, cobalt, molybdenum, bismuth, lanthanum, iron, strontium, titanium, silver, gold, lead, platinum, palladium, yttrium, zirconium, calcium, barium, potassium, chromium, magnesium, copper, zinc, and mixtures thereof.

22. (new) The metal based material of claim 21, wherein the metal supported materials includes the one or more metals deposited on a solid support, the solid support including one or more of, alumina, silica, titania, zirconia, and alumino-silicates.

23. (new) The metal based material of claim 21, wherein the metal based material includes a silver on alumina catalyst including about 1 to about 15 weight percent silver, wherein the crystalline grain size is less than about 1 nanometer.

24. (new) The metal based material of claim 21, wherein the metal based material includes a copper modified zinc oxide catalyst, wherein the crystalline grain size is about 5 to about 12 nanometers and the catalyst has a crystallographic strain of about 1 to about 4 percent.

25. (new) The metal based material of claim 21, wherein the metal based material includes a palladium on aluminum-zirconia catalyst, including a palladium component deposited on an alumina-zirconia support, wherein the palladium component has an average crystalline grain size of less than 1 nanometer, and wherein the catalyst is stable at temperatures up to about 1200°C.

26. (new) The metal based material of claim 21, wherein the metal based material includes one or more of a, cobalt molybdate on gamma-alumina catalyst, cobalt molybdate on silica catalyst, bismuth molybdate catalyst, silver on titania catalyst, gold on titania catalyst, and piezoelectric material.